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PDR

LETTER REPORT

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Contractors Report No._____

Contract Program or Project Title: Definition of Scenarios and Evaluation of Methods for Analyzing Source Terms of Major Accidents Involving UF_6 at NRC-Licensed Fuel Cycle Facilities

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LETTER REPORT

UNION CARBIDE CORPORATION
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March 11, 1983

Mr. S. Bernstein
Transportation Materials
Risk Branch
Division of Risk Analysis
Office of Nuclear Regulatory
Research
US Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Bernstein:

Attached is our monthly progress report covering February 1983 activities of the UF_6 Accident Analysis Handbook project (FIN B0495-2). In February $9,648 were spent. Expenditures so far through the end of February total $172,802.

Sincerely,

M. Siman-Tov

M. Siman-Tov

MS:jmp

Attachment

cc: G. F. Flanagan
A. L. Lotts
J. R. Merriman
D. W. Sheffey, DOE-ORO
E. O. Sternberg

cc/att: W. S. Gregory, LANL
P. C. Owczarski, BPNL

PROGRAM TITLE: Definition of Scenarios and Evaluation of Methods for Analyzing Source Terms of Major Accidents Involving UF_6 at NRC-Licensed Fuel Cycle Facilities

PROJECT MANAGER: M. Siman-Tov

ACTIVITY NUMBER: ORNL #41 88 55 05 6 (189 B0495-3) NRC 60 19 01 05

TECHNICAL HIGHLIGHTS:

Task 2. Identification of Event-Controlling Parameters

Specific accident scenarios for further study have not been identified or selected in conjunction with the NRC Research Review Group.

Task 2A. It has been observed, however, that there are two basic release types of which one or both are applicable to all of the postulated UF_6 accident scenarios, excluding criticality. These types are a directed release and an explosive-type release. (Explosive-type releases are possible but very unlikely; the accident scenario for which an explosive-type release is most plausible is the introduction of a hydrocarbon into a UF_6 cylinder.) Therefore, calculational methods and important parameters can be generally identified and developed based on release type and independent of specific scenarios.

Tasks 2B and 2C. Important parameters needed for the calculational methods specified below in Task 4C will be identified to the extent possible. Event controlling parameters will not be identified specifically since these are functions not only of the calculational methods used but also of specific scenarios and initial conditions.

Task 4. Preparation of Final Draft Documentation for Inclusion in the NRC Accident Analysis Handbook (AAH)

Tasks 4A and 4B. A rough draft of material to be included in Chapters 2 and 3 of the AAH for UF_6 production facilities has been prepared which focuses on UF_6-related accidents. UF_6-related modifications and additions to existing material prepared by Pacific Northwest Laboratories (PNL) for Chapters 2 and 3 on fuel fabrication facilities have been identified.

Tasks 4C and 4D. A list of calculational methods useful for analysis of UF_6 accident scenarios was compiled during January and February. From this list those methods needed for making a first-order approximation of UF_6-release source terms for a ventilation model were identified. These letter methods, which will be discussed and illustrated by examples in Chapter 4 of the AAH, include methods for characterizing UF_6 flow through equipment, piping, and a rupture in containment and for determining choke-flow criteria; a method for evaluating time-dependent physical and thermodynamic conditions in a pressure vessel during a release; a method for estimating

the vapor-solid split resulting from a release of liquid UF_6; a method for analyzing a UF_6 release inside a steam chest; and steady-state and transient homogeneous compartment models for determining the source term (composition, temperature, and pressure) for a ventilation system model.

MEETINGS AND TRIPS:

R. A. Just, M. Siman-Tov, and W. R. Williams attended the quarterly review meeting of the NRC research review group in Bethesda, Maryland, on February 8-9, 1983. ORNL's contribution to Chapters 2, 3, and 4 of the AAH was discussed in general and the calculational methods to be included in Chapter 4 were discussed specifically (see Task 4C above). Representatives of Los Alamos National Laboratory and PNL were also present and discussed the status of their contributions to the multilaboratory AAH project.

REPORTS, PAPERS, AND PUBLICATIONS:

None

PROBLEM AREAS:

Several problem areas were discussed with respect to ORNL's contributions to the AAH project. First, funding was not included in the current funding for publishing the report, "Scenarios and Analytical Methods for UF_6 Releases at NRC-Licensed Fuel Cycle Facilities." Also, several of the techniques to be included in Chapter 4 of the AAH are not documented in publicly-available documents. Additional funding was requested to publish the report and to prepare appropriate supporting documents as well as to prepare a computer program to evaluate physical and thermodynamic properties of UF_6.

No specific input has been received from NRC on selecting scenarios for further study; therefore, the approach noted above under Task 2A is being taken. Since specific scenarios have not been identified and because of the high dependence of event-controlling parameters on initial conditions, event-controlling parameters will not be identified as originally planned in Task 2C. Instead, input parameters to the various calculational methods will be determined and listed.